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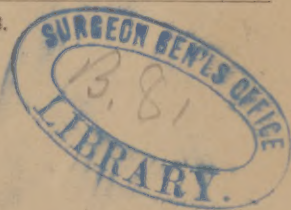
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NOTES
ON THE
HERPETOLOGY
OF
DAKOTA AND MONTANA.
BY
DRS. ELLIOTT COUES AND H. C. YARROW.

*Presented by
Dr. Yarrow*

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From H. C. Yarrow.

ART. XI.—NOTES ON THE HERPETOLOGY OF DAKOTA AND MONTANA.

BY DRS. ELLIOTT COUES AND H. C. YARROW.

The present article is based primarily upon a collection of Reptiles and Batrachians made in Dakota and Montana in 1873-74 by Dr. Coues, as Naturalist of the United States Northern Boundary Commission.

In identifying these specimens, the authors have diligently compared them with other material from the same geographical area in the National Museum, and have added to the species collected by Dr. Coues others known to occur in the region under consideration, thus presenting a tolerably complete list of the Reptiles and Batrachians of the two Territories. No species is introduced that is not fully identified and determined to inhabit this portion of the United States. Care has been taken with the synonymy to exclude doubtful references, except in one or two instances. The descriptions are drawn directly from the specimens, and considerable matter of popular interest has been introduced. The nomenclature and classification are mainly according to Professor Cope's recent Check List, though the authors have not hesitated to differ from this authority on occasion.

A.—REPTILIA.

CHELONIA.

Family EMYDIDÆ.

Genus CHRYSEMYS. Gray.

CHRYSEMYS OREGONENSIS. (Harlan) Ag.

Oregon Golden Turtle.

Emys oregonensis, HARL. Am. Journ. Sci. xxxi. 382, pl. 31.—HOLBR. N. Am. Herpet. i.

—, 167, pl. 16.—DEKAY, N. Y. Fn. iii. 1842, 20.

Chrysemys oregonensis, AG. Contr. Nat. Hist. U. S. i. 1857, 440, pl. 3, f. 1-3.—BD. U. S. Mex. B. Surv. ii. pt. ii. 1859, Reptiles, 4 (Texas).—ALLEN, Proc. Bost. Soc. N. H. xvii. 1874, 68 (Fort Rice, Dakota).

Specimen.

1096. Mouse River, Dakota. Aug. 30, 1873.

Shield Reptiles are not well represented in the region surveyed by



the commission, where the present, the only one observed, appears to be the most characteristic species. Professor Agassiz notices specimens from different localities in Minnesota and from the Yellowstone, where it was also observed by the Prince Maximilian and Mr. J. A. Allen. The former naturalist expresses great doubts respecting the accuracy of Nuttall's statement that it is found in Oregon, as it has never been seen in that Territory by any of the recent explorers, the only true Turtle of the Pacific slopes being the *Chelopus marmoratus* Bd. & Grd. (*Emys nigra* of Hallowell). It is, however, a species of wide distribution in the central region, having been observed southward nearly to the Mexican border in Texas.

The following additional species of this order are indicated by authors as occurring on or near the northern boundary:—

Genus PSEUDEMYIS. *Gray.*

PSEUDEMYIS ELEGANS. (*Maxim.*)

Elegant Terrapin.

Emys elegans, MAXIM. Reise Nord-Amer. i. 1839, 213 (Upper Missouri).—HAYD. Trans. Am. Phil. Soc. xii. 1862, 177 (Yellowstone).

Trachemys elegans, AGASS. Contrib. Nat. Hist. U. S. i. 1857, 435.—BD. U. S. Mex. B. Surv. ii. pt. ii. 1859, Reptiles, 3 (Texas.)

Pseudemys elegans, GRAY.—COPE, Check List Bat. Rept. N. A. 1875, 53.

Emys cumberlandensis, HOLBR. N. Am. Herpet. i. 115, pl. 118 (Tennessee).—DEKAY, N. Y. Fauna, iii. 1842, 20.

Emys holbrookii, GRAY, Cat. Brit. Mus. 1844, 23.

Emys terrapin, WAILES, Geol. Rep. Mississippi, 1854, p. — (*vide* Agass.).

A species originally described from the Upper Missouri by Prinz Maximilian von Neu Wied, and subsequently ascertained to occur throughout the Central region, east to the Ohio, and south to Texas.

Genus CISTUDO. *Fleming.*

CISTUDO ORNATA. *Agass.*

Ornate Box-turtle.

Cistudo ornata, AGASSIZ, Contrib. Nat. Hist. U. S. i. 1857, 445, pl. 3, f. 12, 13.—COPE, Check List Bat. and Rep. N. A. 1875, 53.

The Northwestern type of *Cistudo*, Professor Agassiz remarked, in proposing *C. ornata*, is of all the forms the most likely to be distinct, and such has proven to be the case. "It is round, broad, and flat, without keel, even when young, while the young of *Cistudo virginea* are always strongly keeled." The species is based upon specimens from the Upper Missouri and from Iowa.

Family TRIONYCHIDÆ.

Genus ASPIDONECTES. Wagler.

ASPIDONECTES SPINIFER. (Les.) Ag.

Trionyx spiniferus, LE SUEUR, Mém. Mus. d'Hist. Nat. xv. 258, pl. 6.*Aspidonectes spinifer*, AGASS. Contrib. Nat. Hist. U. S. i. 1857, 403.—COPE, Check List N. A. Bat. and Rep. 1875, 51.*Trionyx ocellatus*, LE SUEUR (young ♀, *sic* Agass.; not of DeKay, which is *Amyda mutica*).*Trionyx ferox*, partim, ALIQ.

The Northern and Northwestern *Aspidonectes*, the characters and synonymy of which were first satisfactorily distinguished from those of the Southern *A. ferox* by Professor Agassiz in the work above cited, is represented as a common species from New York and Pennsylvania to the Rocky Mountains, where it is mentioned as occurring by Lewis and Clarke. According to Say and Allen, it is frequently found in the tributaries of the Missouri; the last-named naturalist took it in the Mussel-shell and Yellowstone. (See ALLEN, Proc. Bost. Soc. Nat. Hist. 1874, p. 69.)

Family CHELYDRIDÆ.

Genus CHELYDRA. Schw.

CHELYDRA SERPENTINA. (L.) Harl.

*Snapping Turtle.**Testudo serpentina*, LINN. Syst. Nat. ed. 12, i. 1766, 354 (localities erroneously assigned as Algiers and China). Also of other older authors.—LEC. Ann. Lyc. Nat. Hist. N. Y. iii. 127.*Chelonura serpentina*, SAY, Journ. Acad. Nat. Sci. Phila. iv. 217.—HOLBR. N. Am. Herpet. 1st ed. iv. 21, pl. 3; 2d ed. i. 139, pl. 23.—DEKAY, N. Y. Fa. iii. 1842, 8, pl. 3, f. 6.*Emys serpentina*, GRAY, Syn. Rept. in Griffith's An. Kingd. ix. 14.*Chelydra serpentina*, HARL. Med. & Phys. Res. 1835, 157.—AGASS. Contrib. Nat. Hist. U. S. i. 1857, 417. And of most late authors.—COPE, Check List N. A. Bat. and Rep. 1875, 51.*Emysaurus serpentina*, DUMÉR. & BIBR. Erp. Gén. ii. 350.—STORER, Rep. Mass. —, 212.*Chelydra emarginata*, AGASS. *op. cit.* in text." *Chelydra lacertina*, SCHW." (young)." *Testudo serrata*, PENN."" *Testudo longicauda*, SHAW."

A species of remarkably extended distribution, from the Northern border of the United States to South America; not, however, in the Pacific region.

OPHIDIA.

Family CROTALIDÆ.

Genus CROTALUS. *Linn.*CROTALUS CONFLUENTUS. *Say.**Missouri Rattlesnake.*

Crotalus confluentus, SAY, Long's Exped. R. Mts. ii. 1823, 48.—BD. & GIR. Cat. N. Am. Reptiles, 1853, 8.—BD. Pac. R. R. Rep. x. 1859, Reptiles of Whipple's Route, 40; pl. 24, f. 4.—BD. U. S. and Mex. B. Surv. ii. pt. ii. Reptiles, 14.—COOP. & SUCKL. Nat. Hist. Wash. Terr. 1860, 295, pl. 12.—COPE, Check List N. A. Bat. and Rep. 1875, 33.

Caudisona confluenta, COPE, App. Mitchell's Researches, 1861, 122.—COPE, Proc. Acad. Nat. Sci. Phila. 1866, 307, 309.—ALLEN, Proc. Bost. Soc. N. H. xvii. 1874, 69.

Crotalus lecontei, HALLOW. Proc. Acad. Nat. Sci. Phila. vi. 1851, 180.—HALLOW. Sitgreaves's Rep. Expl. Zúñi and Colorado, 1853, 139, 147, pl. 18.—HALLOW. Pac. R. R. Rep. x. 1859, Williamson's Route, Reptiles, 18, pl. 3.

Caudisona lecontei, COPE, App. Mitchell's Researches, 1861, 121.—HAYD. Trans. Am. Phila. Soc. xii. 1862, 177.—COPE, Proc. Acad. Nat. Sci. Phila. 1866, 307.

Crotalus cinereus, LECONTE *apud* HALLOW. Sitgreaves's Rep. Expl. Zúñi and Colorado, 1853, 140 (in text).

Specimens.

1149.	Sweet Grass Hills, Montana.	July 29, 1874.
1150.	Sweet Grass Hills, Montana.	July 29, 1874.
1197.	Black Coulé, near Teton River, Montana.	Sept. 6, 1874.
1198.	Black Coulé, near Teton River, Montana.	Sept. 6, 1874.
1199.	Black Coulé, near Teton River, Montana.	Sept. 6, 1874.

The ascribed characters of *C. lecontei*, as compared with *C. confluentus*, are found not to hold good when sufficient series are examined. The number of superior labials in our specimens, and in others from the Yellowstone, ranges from thirteen to sixteen, while in others eighteen are described. Certain ascribed features of coloration are altogether uncertain, as specimens vary interminably in the distinctness of the dorsal blotches and in the details of the light markings about the head. This appears to be due in part to age, as the smaller specimens are usually the most boldly blotched, while on some of the largest examined the markings are nearly obsolete. These statements are fully borne out by our experience, we having noticed in this particular species that the blotching cannot be relied upon as a distinctive character, as in some individuals, notably from localities where the color of the soil is light, the blotches in some instances are barely perceptible; moreover, the forms of the blotches vary indefinitely, as some are serrated on their borders, others present an unbroken line. The distinctness of the pattern of coloration also depends somewhat upon season, the markings being clearest just after the shedding of the skin. There is certainly no specific difference between the two supposed species, and vari-

etal distinction can hardly be predicated, at least upon the characters as yet adduced. In any event, the specimens above enumerated are the true *C. confluentus* of Say. Two of these are of unusual size, being both over four feet in length, a dimension near the known maximum of this species, though less than that of some others. The average length is less than three feet, and the calibre of the body, even in the largest examples, is relatively inferior to that of several Southern species.

The number of rattles in this and other species, though of course increasing with age, is not an infallible clue to the age of a specimen; for, accidental variation aside, it is far from proven that an annual increase by one is regular. On the contrary, the growth of the organ must depend largely, as in all parallel cases, upon the vigor of the individual, which is not the same at all periods of life, granting even a continuous state of perfect health. The purpose subserved in the economy of the animal by this singular organ has been the subject of much speculation and discussion. It is difficult to perceive of what use the rattle can be, either in procuring prey or avoiding enemies. We do not know that it comes into play at all in the pursuit of prey, while the actual result of its use as a menace in self-defence is the reverse of beneficial to the serpent, since the sound serves to direct and provoke attack from all enemies which the animal has occasion to fear. The theory that the rattle is a part of the serpent's means of terrifying its intended victim, used as an adjunct of other supposed powers of fascination, may be safely held in check until it is proven that this peculiar influence is ever exerted to the extent of preventing its prey from seeking safety in flight. The notion that the rattle is intended to serve as a warning, and thus offset the venomous nature and highly dangerous powers of the serpent, is contrary to all analogy, since animals are endowed with attributes for their own good, irrespective of the result upon others, and would require a faith in the intervention, for the benefit of the dominant species of the *Mammalia*, of special Providences, a belief now held by few thoughtful persons. It has been suggested that the rattle may be used to call the sexes together, and thus serve a useful purpose in the perpetuation of the species,—a hypothesis less untenable than some of the others which have been advanced. Another supposition, made irrespective of "final causes", is, that the rattle has resulted, in the course of time, from the continual agitation of the caudal extremity of these highly nervous and irritable creatures, and that it has no special function. This seems not unreasonable, although, in view particularly of the fact that rattlesnakes alone, of the many equally or more venomous reptiles, have such appendage, it is not entirely satisfactory. One thoroughly established fact concerning the rattle is that its practical operation is injurious to its possessor by provoking attack from those who can cope with it successfully. It may be suggested, that inasmuch as to an unpracticed ear the rattle of the *Crotalus* cannot be distinguished from the crepitation of the large Western grasshopper, it may serve the purpose of attracting

within reach of the fangs of the snake the many birds who greedily devour these insects. The rattle has been heard at times when no apparent cause of irritation to the snake existed, and a case has been reported in which a biped was drawn within reach of a rattler, thinking it a grasshopper.

The principal enemies of the rattlesnake, besides man, are wild hogs, peccaries, and deer. The latter kill the serpent when coiled by striking with the hoofs; the former attack it successfully with hoofs and teeth, and in some regions derive no small part of their subsistence from this source. The popular belief that the venom of the rattlesnake is innocuous to hogs is merely a partial statement of the fact that the fluid usually fails to enter the circulation through the layer of adipose tissue with which these animals are commonly covered. The venom is conceded to be innocuous when introduced to the stomach, and the flesh of the rattlesnake is as edible as that of other serpents. The fatality of the rattlesnake's bite is by no means the constant element generally supposed, but the result may vary from the slightest amount of poisoning to one rapidly fatal. This depends altogether upon the amount of venom absorbed in the system, and the rapidity of its diffusion through the circulation, matters which turn upon the amount of venom in store at the moment of striking, the vigor of the animal at the time, the penetration of the tooth, the part of the body struck, and, finally, the state of health of the person attacked. No positive specific antidote is known. Surgical means of preventing dispersion of the poison through the system, and alcoholic stimulation to the highest pitch, are the usual resorts.

It may not be out of place to refer in this connection to the interesting mechanism of the poison apparatus, as it is a matter not very generally known as yet, though clearly set forth by the researches of specialists, notably Dr. S. Weir Mitchell. The venomous fluid to be injected into a wound made by the teeth has nothing to do with the ordinary saliva, as popularly supposed; nor does the forked tongue or any of the numerous small teeth of the mouth take part in the infliction of the wound. The tongue and smaller teeth are essentially the same as in any harmless serpent. The active instruments are a pair of fangs,* one on each side of the upper jaw, rooted in the maxillary bones, which bear no other teeth. The fangs vary in size, being sometimes half an inch long. They are somewhat conical and scythe-shaped, with an extremely fine point; the convexity looks forward, the point downward and backward. The fang is hollow, for transmission of the venom; but

* It may be mentioned, as a fact of some interest, that, while in *C. confluentus* the fangs are generally shed or pushed out of place at variable periods of time (probably in twelve months), in *C. adamanteus atrox*, a species common in the Sonoran region, this shedding, or loss, frequently fails to take place, and it is common to find generally in the right side of the jaw of this species two or more fangs in position. In one specimen lately examined, three were found in position, and behind them three or four others were advanced in growth.

the construction of the tube is not as if a hole had been bored through a solid tooth. It is in effect a flat tooth, with the edges rolled over together till they meet, converting an exterior surface, first into a groove, finally into a tube. This is shown, on microscopic examination of a section of the tooth, by the arrangement of the dentine. Unlike an ordinary tooth, the fang is movable, and was formerly supposed to be hinged in its socket, since it is susceptible of erection and depression. But the tooth is firmly socketed, and the source of this movement is the maxillary bone itself, which rocks to and fro by a singular contrivance. The maxillary is a small, stout, triangular bone, movably articulated above with a smaller one, the lachrymal, which is itself hinged upon the frontal. Behind, the maxillary articulates with the palatal and pterygoid, both of which are of rod-like shape, and are acted upon by the spheno-ptyergoid muscle, the contraction of which pushes them forward. This forward impulse of the palatal and pterygoid is communicated to the maxillary, against which they abut, causing the latter to rotate upon the lachrymal. In this rocking forward of the maxillary, the socket of the fang, and with it the tooth itself, rotates in such manner that the apex of the tooth describes the arc of a circle, and finally points downward instead of backward. This protrusion of the fang is not an automatic motion, consequent upon mere opening of the mouth, as formerly supposed, but a volitional act, as the reverse motion, namely, the folding back of the tooth, also is; so that, in simply feeding, the fangs are not erected. The folding back is accomplished by the ecto-ptyergoid and spheno-palatine muscles, which, arising from the skull behind as a fixed point of action, in contracting draw upon the jaw-bones in such a way that the maxillary, and with it of course the fang, are retracted, when the tooth is folded back with an action comparable to the shutting of the blade of a pocket-knife. All the motions of the fangs are controlled by these two sets of antagonistic muscles, one of which prepares the fangs for action, while the other stows them away when not wanted.

The fangs, when not in use, are further protected by a contrivance for sheathing them, so that they rest like a sword in its scabbard. This is a fold of mucous membrane, the *vagina dentis*, which envelopes the tooth like a hood, enwrapping its base, and slipping down over its length, partly as a consequence of its elastic texture, partly on account of its connections. Erection of the fang causes the sheath to slip off, like the finger of a glove, and gather in folds around the base of the tooth. This arrangement can be readily examined without dissection.

The poisonous fluid is secreted in a gland which lies against the side of the skull, below and behind the eye, of a flattened oval shape, obtuse behind, tapering in front to a duct that runs to the base of the tooth. Without going into the minute anatomy of the gland, it may be described as a sac, or reservoir, in the walls of which the numerous secretory follicles are imbedded; it is invested with two layers of dense, white, fibrous

tissue, the outer of which gives off three strong ligaments that hold it in place. In a large snake, the entire gland may be nearly an inch long and one-fourth as wide, weighing, empty, ten or twelve grains, and having a capacity of ten or fifteen drops of fluid. There is no special reservoir for the venom, other than the central cavity of the gland. A certain dilatation of one portion of the duct, formerly supposed to be such storehouse, is due to thickening of its walls, without corresponding increase of capacity, resulting from muscular fibres which serve as a sphincter to compress the canal and prevent wasteful flow of the contents. There is further provision to this same end. When the tooth is folded back, the duct attached to its root is submitted to some strain, which pushes it against a shoulder of the maxillary bone, and tends to shut off the communication.

The injection of the venom, though to all appearance instantaneous, is a complicated process of several rapidly consecutive steps. Forcible voluntary closure of the jaws may always be, if desired, accompanied by a gush of the venom, owing to the arrangements of the muscles which effect such movement of the under jaw. These are the *temporales*, one of the three of which is situated in such relation to the poison-sac that its swelling in contraction presses upon the receptacle and squeezes out the fluid. The force of ejection is seen when the serpent, striking wildly, misses its aim; under such circumstances, the stream has been seen to spirt five or six feet. A blow given in anger is always accompanied by the spirt of venom, even when the fang fails to engage, from whatever cause. But since this result does not follow upon mere closure of the mouth, it is probable that the two posterior temporals ordinarily effect this end, the more powerful action of the anterior temporal (the one which presses upon the poison-sac) being reserved for its special purpose. There is one very curious piece of mechanism to be noted here. Since the serpent always snaps its jaws together in delivering a blow, the points of the erected fangs would penetrate the under jaw itself in case they failed to engage with the object aimed at, were there no contrivance for preventing such disaster to the snake. But there is a certain movement among the loose bones of the skull, perhaps not well made out, the result of which is to spread the points of the fangs apart in closure of the mouth, so that they clear the sides of the under jaw, instead of impinging upon it.

The complicated mechanism of the act of striking may be thus described:—The snake prepares for action by throwing itself into a number of superimposed coils, upon the mass of which the neck and a few inches more lie loosely curved, the head elevated, the tail projecting and rapidly vibrating. At the approach of the intended victim, the serpent, by sudden contraction of the muscles upon the convexity of the curves, straightens out the anterior portion of the body, and thus darts forward the head. At this instant, the jaws are widely separated, and the back of the head fixed firmly upon the neck. With the opening of the mouth,

the speno-palatines contract, and the fangs spring into position, throwing off the sheath as they leap forward. With delivery of the blow and penetration of the fangs, the lower jaw closes forcibly, the muscle that executes this movement causing simultaneously a gush of venom through the tubular tooth into the wound. There are also some secondary actions, though all occur at nearly the same instant. The mouth fixed at the wound drags upon it with the whole weight of the snake's body. This dragging motion is accompanied by contraction of the ectopterygoid and speno-palatine muscles, which ordinarily fold back the tooth; but the fang being at this moment engaged in the flesh, the action of the muscles only causes it to bury itself deeper, and thus enlarge the puncture. The train of action seems to be, the reaching of the object, the blow, the penetration, the injection of the poison, and the enlargement of the wound. These actions completed, the serpent loosens its hold by opening the jaws, and disengages itself, sometimes not without difficulty, especially when the bitten part is small and the numerous small teeth have caught. The head is withdrawn, the fangs folded, the mouth closed, and the former coiled attitude of passive defense is resumed.

These remarks apply in substance to other species as well as to the one now under special consideration. Upward of eighteen species, not counting *Ancistrodon*, are described as inhabitants of the United States, nearly all of which occur in the West and Southwest. Our rattlesnakes fall in two genera, *Crotalus* and *Caudisona*, readily distinguished by the scutellation of the head. In the former, the top of the head is covered with a large number of small asymmetrical scales like those on the body; in *Caudisona*, the same region is shielded by a definite small number of large flat places symmetrically disposed. *Crotalus horridus* is a most widely dispersed species of Eastern North America, the only other species of the same portion of the continent being *C. adamanteus*, the "Diamond" rattlesnake of the South Atlantic and Gulf States. With the latter is found associated a species of *Caudisona*, namely, *C. miliarius*, the small spotted rattlesnake; but the best known species of the latter genus is *Caudisona tergeminus*, the common "Massasauga" of the interior States and of the Plains. Texas, New Mexico, and Arizona furnish the largest number of species.

Crotalus confluentus is a species of more and general distribution in the West, from the Mexican to the British boundary, and on both sides of the Rocky Mountains. It is associated in some parts with the Massasauga, but in other regions, as in the one now under consideration, it is the only known representative of its family. It appears to be particularly numerous in the region of the Yellowstone, where, according to Mr. Allen, it was estimated that two thousand were killed during the expedition of 1872. Farther northward, it is less abundant, though fairly to be considered common in the region of the Upper Missouri and Milk River and some of their northern tributaries. Along the

northern boundary line, its distribution appears to be determined very nearly by the Missouri watershed, as limited by the Coteau. This carries its range somewhat into the British Possessions, so that it is probably the most northern species of the genus. It does not appear to exist along that portion of the line represented by the watershed of the Red River of the North, where none were observed by the commission. I shall have frequent occasion to allude to the great difference in the fauna and flora of these two portions of the line sharply divided by the Coteau of the Missouri. The presence among plants of the *Opuntia missouriensis* and the prevalence of *Artemisia*, the occurrence of *Centrocercus urophasianus* among birds, of *Cynomys ludoricianus* among mammals, and of *Phrynosoma douglasi* and *Crotalus confluentus* among reptiles, are some of the prominent features of the Missouri watershed as contrasted with that of the Red River. *C. confluentus* is also found extending to New Mexico, Utah, Colorado, Arizona, California, Nevada, and even to the islands of Santa Barbara Channel, California; but the typical *Crotalus* of the Sonoran region is *C. adamanteus atrox*, a subspecies of our Southern serpent, of the Pacific. *C. lucifer*, a well-marked and distinct form, is found in Arizona and the Pacific region.

The pairing season of these serpents is in midsummer, when they have several times been observed *in coitu*. Little, however, has been ascertained respecting their reproduction. About half the year, in most latitudes, they hibernate in holes in the ground. They have, however, been observed abroad after severe frosts in the Yellowstone region. At Fort Randall, on the Missouri, they were stated to reappear in May with the loosening of the ground from frost. As in the case of other species, there is a regular *annual*, or perhaps, as in some other Ophiidians and as in Saurians, a more frequent casting of the skin. During the moult, they are reported to be specially venomous, but probably upon no other foundation than that at this time their sluggishness results in the accumulation of a large supply of the poisonous fluid. In one of the specimens secured were found the remains of a Prairie Squirrel (*Spermophilus richardsoni*), the most abundant mammal of the Milk River region; and it is probable that these animals, together with the allied species, form a large part of their subsistence.

While the venomous properties of these reptiles, not easily overrated, should suffice to ensure due caution in capturing or killing them, it is as well to remember that the utmost range of a rattlesnake's blow is less than its own length. They may readily be captured alive by pinning down the neck with a forked stick, and may be handled with impunity, when not too large and powerful, if seized immediately behind the head. In case of a strong snake, however, the power of constriction is sufficient to paralyze the muscles of both arms, as in the case of a person we knew who had seized two of these reptiles by the back of the neck. He had to be relieved by a bystander. A method employed in the South to capture the *C. adamanteus* is perhaps worthy of mention. A silk

handkerchief is fastened to the end of a pole, which is held toward the reptile, which strikes fiercely at it, the fangs and teeth become engaged in the fibre of the silk, and a dexterous movement of the stick readily pulls out the fangs, and the reptile can be approached with safety.

There seems to be a special and peculiar enmity existing between the Rattlesnake and Moccasin and the Blacksnake (*Bascanium*) and "King Snake" (*Ophibolus getulus sayi*); these two latter species waging a constant warfare against the former, and invariably conquering, according to information received from reliable parties. After the conflict, the vanquished is eaten by the victor. In one case reported, a large Blacksnake (*Bascanium constrictor*) had seized a Rattlesnake (*Crotalus adamanteus*), and entwined two or more folds behind his head and several six or eight inches farther back; then by muscular effort had torn the body. It is a well-known fact that both Rattlesnakes and Moccasins will endeavor to get away from the "King Snake" (*Ophibolus getulus sayi*); and in the South this beautiful and harmless species is protected in view of this fact.

Genus CAUDISONA. *Laur.*

CAUDISONA TERGEMINA. (*Say*) *Cope.*

The Massasauga, or Prairie Rattlesnake.

Crotalus tergeminus, SAY, Long's Exped. R. Mts. i. 1823, 499.—HARLAN, Jour. Acad. Nat. Sci. Phila. 1827, 372.—COPE, Mitchell's Researches, App. 1861, 125.—HAYD. Trans. Amer. Phil. Soc. xii. 1862, 177 (Yellowstone).

Crotalophorus tergeminus, GRAY, Synop. Rept. 78; Cat. Rept. Br. Mus. 18.—HOLBR. N. Am. Herpet. 2d ed. iii. 1842, 29, pl. 5.—DEKAY, N. Y. Fa. iii. 1842, 57.—BD. & GIR. Cat. N. A. Rept. 1853, 14.—BD. P. R. R. Rep. x. 1851, pl. 25, f. 9 (no text).

Caudisona tergemina, COPE, Check List N. A. Bat. and Rep. 1875, 34.

Crotalophorus ———, AGASS. L. Superior, 1850, 381, pl. 6, f. 6, 7, 8.

Var? (*Black Massasauga.*)

Crotalophorus kirtlandii, HOLBR. N. Am. Herpet. 2d ed. iii. 1842, 31, pl. 6.—GRAY, Cat. Br. Mus. 18.—BD. & GIR. Cat. N. A. Rept. 1853, 16.—BD. P. R. R. Rep. x. 1859, pl. 251, f. 11, 11 bis (no text).

Crotalophorus massasauga, KIRTL. apud BD. Serpents N. Y. 11, pl. 1, f. 2.

This species is distributed in prairie countries from Ohio and Michigan westward, finding its most western limit in the region of the Yellowstone. It is readily distinguished from any species of *Crotalus* by the presence of few (9) large symmetrical plates on the head, as in serpents generally, instead of numerous small scales, like those on the body. The rattle is much smaller than in *Crotalus*. The size varies from one to three feet. The ground-color above is brown, marked with blotches of deep chestnut-brown, blackish on the periphery, and margined with yellowish-white.

Family COLUBRIDÆ.

Genus HETERODON. *Beauv.*HETERODON SIMUS NASICUS. (*B. & G.*) *Cope.**Hog-nosed Snake; Sand Viper; Puffing Viper; Blowing Adder.*

Heterodon nasicus, BAIRD & GIRARD, Stansbury's Exp. Great Salt Lake, 1852, 352.—BAIRD & GIR. Cat. N. A. Reptiles, 1853, 61, 157.—HALLOW. Sitgr. Rep. Expl. Zuni and Colorado R. 1853, 147.—BD. P. R. R. Rep. 4, 1859, Whipple's Route, Reptiles, 41.—BD. P. R. R. Rep. x. 1859, Beckwith's Route, Reptiles, 19.—BD. U. S. Mex. B. Survey, ii. pt. ii. 1859, 18, pl. 11, f. 1.—HAYD. Trans. Amer. Phil. Soc. xii. 1852, 177.—COPE, Proc. Acad. Nat. Sci. Phila. 1866, 307.—ALLEN, Proc. Bost. Soc. Nat. Hist. xvii. 1874, 69.

Heterodon simus subsp. *nasicus*, COPE, Check List Bat. and Rep. N. A. 1875, 43.

Specimen.

No. 1101. Big Muddy River, Montana. June 25, 1874.

The serpents of the genus *Heterodon* are medium-sized or rather small species, thick-set in form and sluggish, of repulsive aspect, not distantly resembling some of the venomous species, especially the Copperhead (*Ancistrodon contortrix*). The similarity to poisonous species is heightened by the flat, broad, triangular shape of the head and the habit of hissing when irritated. They are commonly called "Adders" and "Vipers", and are reputed venomous; nevertheless, they are perfectly harmless. They cannot be provoked to bite. The belief in the poisonous qualities is further heightened by the presence of two tolerably large teeth in each upper jaw, resembling fangs, these teeth being the ninth (?) of the series in some individuals, their bases being below the fifth upper labial. There is no groove present, nor is the tooth movable. We do not know that this fact has ever been before mentioned, although the post-palatine teeth are spoken of as being larger than others. These large teeth have, however, a sort of sheath over them, similar to the fang-sheath of *Crotalus*. There is an interval between the small anterior teeth, and these are not contained in the same sheath as the fang-like tooth, which in some cases is found to have in its sheath one or more smaller fang-like teeth. They may be distinguished from any other serpents of this country by the sharp-pointed and elevated end of the muzzle, the rostral plate being prolonged into a spur.

The present species finds its nearest ally in the *Heterodon simus* of the Southern States, sharing with this species the separation of the median plate behind the rostral from the frontals by the interposition of several small plates. From *H. simus* it is distinguished by the slaty-black, which occupies all or most of the under surface. The color above is an obscure grayish-brown, with very numerous darker blotches along the

dorsal line, and usually other smaller ones on the sides. But the markings are never bold, sometimes nearly obsolete.

This is the most abundant and wide-ranging species of the genus, occurring throughout the West east of the Rocky Mountains. The specimen above noted is particularly interesting in the fact that it is the northernmost one hitherto recorded, demonstrating a wider range, not only of the species, but of the genus, than was before known. Mr. Allen procured it on the Yellowstone, and it appears to increase in numbers southward, being one of the more common serpents of New Mexico and Arizona. I am under the impression that I saw the same species beyond the Missouri watershed, at Chief Mountain Lake; but the individual was unfortunately not secured.*

* Professor Cope, in his recent Check List, has seen fit to reduce the numbers of species of this genus to four, which are readily separated into two groups as follows:—

A. *Heterodon platyrhinus*.

Heterodon platyrhinus subspecies *atmodes*.

With the azygos behind the rostral plate in contact with the frontal plates.

B. *Heterodon simus* subspecies *simus*.

Heterodon simus subspecies *nascius*.

With the azygos behind the rostral plate separated by a varying number of small plates.

In this connection, it may be mentioned that if color should be taken into consideration as a specific marking, it seems that Baird and Girard's *H. niger* should be admitted as a subspecies of *H. platyrhinus*, for not only is there a very marked difference of coloration (some species of *H. niger* being entirely black), but as a rule the rostral of *H. niger* is much more developed than that of *H. platyrhinus*, and the dorsal carina are acute and very well marked, and there are obvious differences in the size of the scales. It is true that in examining a number of specimens of *H. platyrhinus*, *H. niger*, and *H. atmodes*, it will be found that a regular intergradation of color exists; but if *atmodes* is to be admitted as a good and valid subspecies of *H. platyrhinus*, it would seem that *H. niger* is entitled to the same respect. In an examination of the different specimens of *Heterodon* in the National Museum, Smithsonian Institution, the authors were fortunate enough to discover a species called *Heterodon kennerlyi* by Kennicott, in the Proceedings of the Acad. of Nat. Sci. Phila., 1860, pp. 336 and 337; and as after a careful examination of several specimens, the specific characters of them compare entirely with the type, the entire description is here given. The species naturally falls near the *B.* or *simus* group, in which the azygos is separated from the frontals, not by a varying number of plates, but by exactly two plates in five specimens and by three in one specimen. These specimens are from the following localities:—

1282. Matamoras, Texas.

7290. Lower Rio Grande.

5185. Fort Stockton, Texas.

8878. Southern Arizona.

8413. Southern Arizona.

A comparison of these specimens with eighteen well-marked species of *H. simus nascius* shows that although these latter vary as to the number of scales separating the azygos and frontals, in no respect does it approach the regularity and systematic arrangement of the scales in *H. simus kennerlyi*.

HETERODON SIMUS KENNERLYI. (*Kennic.*) C. & Y.

H. kennerlyi, Kennicott.

SPEC. CHAR.—Head broad, very short anteriorly. Rostral plate very large. Loral plate very small, sometimes absent. Only two supplemental plates behind the azygos;

Genus EUTÆNIA. *Baird & Girard.*

Coluber, Tropidonotus, sp., AUCT.

Eutainia, BAIRD & GIRARD, Cat. N. Am. Reptiles, 1853.

Eutania, emend.

To the few species of this genus known to the older authors under the names of *Coluber* or *Tropidonotus*, many were added, in 1853, by Baird and Girard, at the date of establishment of the genus *Eutania*, a majority of the fifteen species described in the catalogue of the authors

the latter is sometimes replaced by two symmetrical contiguous plates, and without any supplemental. The prenasal and prefrontal in contact with the posterior process of the rostral. Dorsal row of scales twenty-three, all carinated except the first and second, which are perfectly smooth. Ground-color light yellowish gray; a dorsal series of rather indistinct, rounded or subquadrate, brown blotches; a second series of smaller, circular spots, much darker and more distinct; below this a third and more indistinct series.

DESCR.—In its general form and appearance, this resembles the *H. nasicus*, with which it is sometimes found associated. The body, however, is rather shorter and thicker than in *H. nasicus*, and the head is broader, with the part of the head anterior to the eye decidedly shorter. The nasals are not as well developed longitudinally as in *H. nasicus*, but the result of this shortness of the anterior part of the head is seen in the very small loreal, which is frequently wanting entirely. There is never more than one loreal, while frequently two are seen in *H. nasicus*, in which the loreal is in every case strikingly larger than in *kennerlyi*. The most striking difference between these species is in the number of small plates surrounding the azygos or postrostral. While in *H. nasicus* there are always at least ten of these, one or two of which margin the inner edges of the prenasals and prefrontals, there are never more than two, and frequently but one additional plate, in *H. kennerlyi*, and the prenasal and prefrontal are always in contact with the posterior process of the rostral. The azygos is short, nearly as broad as long, and usually there are just behind it two contiguous plates of about the same size, separating it from the postfrontal, but not from the prefrontal. Frequently, however, the azygos is longitudinally divided, and without any additional plates, but in contact with the rostral anteriorly, and the vertical posteriorly, and not separated from the postfrontals. The vertical, occipitals, superciliaries, and labials are much as in *H. nasicus*, though generally less developed longitudinally. The rostral is as large as in *H. nasicus*. The two outer dorsal rows are both perfectly smooth; in *H. nasicus*, the second is distinctly though delicately carinate.

The ground-color is light yellowish-gray, with a dorsal series of rather indistinct subquadrate or rounded blotches, two to two and a half scales long, and separated by intervals of one or two scales, rather wider anteriorly. Below this is a series of very distinct, purplish-black, circular blotches, covering four scales transversely and two longitudinally; below this one or more indistinct series of spots. This pattern of coloration is very similar to that of *H. nasicus*, but the ground-color is always lighter, and the dorsal spots are lighter and less distinct. The upper lateral series is of a purplish-black, and much more distinct, forming a prominent character.

Abdomen nearly entirely black, except a few yellow senta. The head is marked as in *H. nasicus*, except that the nasals, prefrontals, and rostral are all yellowish; while, in the latter species, they are dark in front of the light transverse line which crosses the crown behind the rostral; and, in *H. kennerlyi*, the light line across the superciliaries and vertical is much broader than in *H. nasicus*. This species differs from *H. sinuatus* in many of the same features as does *H. nasicus*. These, together with the small or absent loreal and small number of supplemental plates, will readily distinguish it.

Rio Grande (Dr. Kennerly). Sonora.

just named being new. To these several more have since been added, chiefly by Mr. Kennicott and Professor Cope, from various parts of the West, the present number of current United States species being over twenty.

That the species of this large and difficult genus require thorough critical revision, with a reduction of the number of accredited species, will be evident to any one who undertakes the identification of any considerable series of specimens. A certain proportion of the specimens cannot be referred without hesitation to the described species they are supposed to represent, or, rather, may be referred, with about equal propriety, to more than one such species. This indicates either that the descriptions drawn from particular type-specimens are too exclusive to fairly afford specific diagnoses, or that the supposed species they represent are not valid, but blend with each other through intermediate specimens. There is unquestionably a gentle and complete intergradation between several of the accredited species.

Too much stress altogether has been laid, in the preparation of specific diagnoses, upon points which should properly be only adduced in illustration of the normal inherent range of variation of the individual, and have no value whatever as functions of the actual specific equation. For instance, "superior labials seven" and "superior labials eight" are expressions found in the diagnosis of certain species as distinguishing marks. Whereas the fact is, as any one may satisfy himself by examination of the first dozen specimens of *Eutania* that come to hand, that the superior labials may be either seven or eight in different specimens of indubitably the same species, or that there may be eight of them on one side of the mouth, and seven on the other, in the same specimen. Subdivisions of the genus have been based upon the number of dorsal rows, whether 17, 19, or 21. Whereas it is a fact that different specimens vary a pair or two of scales in this respect, and that different parts of the body of the same specimen show a different number of rows of scales. Other matters, such as the width and sharpness of definition of the characteristic stripes, and the special tinge of coloration of these and other parts of the body, might be mentioned in similar terms.

As far as we have seen, the position of the lateral stripe may be a means of grouping the species. Though this varies within certain limits, mainly according to the width of the band, yet its position on the third and fourth, or on the second and third, dorsal rows, affords a ready means of distinguishing certain sets of species or varieties.

Along the northern boundary, *Eutania* is the best represented genus of *Ophidia*, and indeed of *Reptilia*, not only in numbers of individuals, but of species as well. They occur in all situations, excepting, as a rule, the most arid regions, and are particularly numerous about the prairie pools and sloughs and along the banks of the various streams. All the species represented are more or less aquatic, particularly during

the season of reproduction. Several hundred individuals fell under Dr. Coues's observation, of which a sufficiently large series of upward of fifty specimens, representing all the species known to occur in this region, was preserved.

These specimens include three perfectly distinct species. One of these is the wide-ranging *E. vagrans*, almost universally distributed in the West. Another is of the *sirtalis* type, and the third, more abundant and characteristic than either of the others, belongs to the *radix* group, and occurs under two varieties geographically distinguished. Without reference to other species of the genus, the three just indicated may be readily distinguished by the following analysis:—

A. Lateral stripe on the second and third rows of dorsal scales.

a. Dorsal rows commonly 21; normally 8 superior labials.

Body brown, with numerous small dark spots in two rows, nicking into the narrow inconspicuous stripes; no red; no bands on head; belly variably plumbeous. *vagrans*.

b. Dorsal rows commonly 19; normally 7 superior labials.

Body pitchy-black, without spots, but mixed with small vermilion-red spaces; the stripes broad, firm, and perfectly continuous. *sirtalis parietalis*.

B. Lateral stripe on the third and fourth rows of dorsal scales; superior labials normally 7; normally 21 rows of scales.

a. Pitchy-black and equally so below and above the lateral stripe; dorsal and lateral stripes narrow; both gamboge-yellow, not contrasted with each other. *radix*.

a". Olivaceous-black; lighter or interrupted below the lateral stripe; dorsal stripe broad, rich chrome-yellow, contrasted with the pale gamboge-yellow lateral stripe. *radix twinengi*.

EUTÆNIA VAGRANS. *B. & G.*

Wandering Garter Snake.

Eutania vagrans, Bp. & Gir., Cat. N. A. Reptiles, 1863, 35 (Texas and California to Puget Sound).—Gir. U. S. Expl. Exped. Herpet. 1858, 154, pl. 14, f. 5-10.—Bp. P. R. R. Rep. x. 1859, Beckwith's Route, Reptiles, 19, pl. 17.—Coop. & Suckl. N. H. W. Terr. 1860, 297.—Cope, Proc. Acad. Nat. Sci. Phila. 1866, 395, 397.
Eutania vagrans subsp. *vagrans*, Cope, Check List N. A. Bat. and Rep. 1875, 41.

Specimens.

1151.	Sweetgrass Hills.	August 3, 1874.
1157.	Sweetgrass Hills.	August 3, 1874.
1157 bis.	Sweetgrass Hills.	August 3, 1874.
1157 ter.	Sweetgrass Hills.	August 3, 1874.
1184.	Chief Mountain Lake.	August 23, 1874.

DESCRIPTION (from Nos. 1157, *bis*, *ter*).—This is a rather small species, the largest specimens seen being little over two feet in length, of slender form, and inconspicuous coloration, by reason of the narrowness of the bands, their dull color, and their indentation by the series of dark spots. On a general view, these spots are nearly as evident as the bands them-

selves, being quite blackish and set off upon the general dull grayish-brown ground-color. The under parts are dull slaty-gray, variously speckled and blotched with slaty-black, which in some cases prevails over the gray, especially on the hinder part of the body. The dorsal and lateral bands are alike pale dull yellowish. The dorsal stripe at its broadest points is one scale and two half scales wide; where encroached upon by the black spots, it is reduced to a single scale, or even interrupted altogether. These spots are generally opposite, giving a beaded character to the dorsal stripe; sometimes alternate, when the band appears zigzag; and both these conditions may be found at different points on the same specimen. The lateral stripe is less firm than the dorsal, since it is not only beaded along its upper edge by the lower one of the two series of lateral spots, but also blended to a degree with the color of the first row of scales along which it lies, as usual in those species in which this stripe is on the second and third rows. The first row of dorsal scales is colored like the belly, not like the back. The lateral dark spots, very numerous, and, as already said, quite conspicuous, are mostly alternate with each other, in some places opposite. The plates of the head are light brown, excepting the labials, which are colored like the body.

Twenty-one rows of scales is normal in this species, and the lateral stripe occupies the second and third. The head is large and especially wide, and the muzzle blunt. The superior labials are eight in two and a half of the three specimens under examination, the other half of the third specimen having seven. The discrepancy occurs, as usual, among the smaller anterior ones, the eye being in all situate over the fourth and fifth, counting from behind. The third from behind is the largest of the series. The length of the tail is contained $4\frac{2}{3}$ times in the total length; $3\frac{3}{8}$ times in the length of the body alone.

E. vagrans exhibits in a marked degree the variation in number of labials, also of the anterior and postorbital plates. The species is peculiarly characteristic of the Central region, but it is found exceedingly numerous in Utah, Co'orado, and Arizona, generally in mountains.

The Wandering Garter Snake does not appear to be generally distributed along the northern boundary line. It was not met with during the first year of my connection with the Survey in any part of the Red River watershed, nor was it seen the second season except to the westward from the outliers of the Rocky Mountains to the main chain itself. We may conclude that its northwestern limits of distribution are indicated in these points. The species was originally described from the Pacific slope, Puget's Sound, California, and New Mexico, and has since been shown to be of very general dispersion in the West, on both sides of the mountains.

EUTÆNIA SIRTALIS PARIETALIS. ⁴(Say) Cope.*Parietal Garter Snake.*

Coluber parietalis, SAY, Long's Exp. R. Mts. i, 1823, 186.—HARL. Journ. Phila. Acad. v. 1827, 349.

Eutania parietalis, BD. & GIR. Cat. N. A. Rep. 1853, 28.

Eutania sirtalis subsp. *parietalis*, COPE, Check List N. A. Bat. and Rep. 1875, 41.

Specimens.

1180. Chief Mountain Lake. August 19, 1874.

1193. St. Mary's River. August 28, 1874.

DESCRIPTION (No. 1180, Chief Mountain Lake).—This is one of the larger species of the genus, frequently attaining a length of three feet, although, at the same time, the average dimension is less than this. It belongs strictly to the *sirtalis* group, and in fact is not specifically separable from that species. It is a rather slender and elegant snake; and, when found inhabiting the clear cold mountain streams or lakes, one of the most beautifully colored representatives of the genus, the stripes being firm and bold, and the dark body color being relieved with rich red in marked contrast. The coloration as observed in life in the Rocky Mountain specimens in August is as follows:—

The dorsal band, which is one scale and two half-scales broad, firm and perfectly continuous from head to end of tail, without indentation for the dark body-color, is pure yellow, fading to pale naples-yellow in alcohol. The tint is clearer than that of the lateral bands, which are rather of a heavier golden-yellow from some suffusion with the red that beautifully mottles the sides. The lateral stripe is as firm and continuous as the dorsal one, and broader, occupying two whole scales (of the second and third rows). The body-color is black, without obvious shade of brown or olivaceous, speckled between the scales with rich vermilion-red, which is very conspicuous on stretching the skin, forming an incomplete zigzag annulation. This red does not reach as high as the dorsal stripe, but extends through the lateral stripe, and occurs on the first dorsal row as a speck on the lower corner of each scale, and on the corresponding angle of the gastrosteges. The color is chiefly on the skin itself between the scales, but also suffuses the edges of many scales themselves. The first dorsal row of scales, which are much wider than the others, are colored like the belly; this lighter inferior boundary of the lateral stripe causes the stripe itself to appear less firm in outline below than above. The belly is not blackish or even slaty, but of a peculiar pale glaucous greenish, much as in *sirtalis*; but black appears as a pair of small, round, lateral spots on each scute at its front border. The head is olivaceous-blackish, the rostral, loreals, and labials being like the belly. Length 31 inches; tail about $\frac{1}{3}$ of the total length— $\frac{1}{4}$ of the length of body alone. Gastrosteges 157; urosteges 64, all bifid. Superior labials seven on both sides; the fifth largest in this and a second specimen examined. In No. 1180, the labials of the left side

have a small intercalated scale between the second and third. No. 1193, from the Saint Mary's River, August, is larger than the other, measuring about thirty-six inches; it is similar in general coloration, but less richly marked, the red suffusion being of less extent and intensity.

This slender and elegant species was only observed at and near the end of the Line, at the eastern base of the Rocky Mountains, in August. It was common in the clear cold waters of the lakes and streams, and appeared to be one of the most thoroughly aquatic species of the genus, being often seen swimming freely in deep water at some distance from the shore. At this season, all the female individuals observed were gravid with nearly matured embryos. Like other of the genus, the species is ovo-viviparous, the young being some six inches in length when born. Newly-born individuals are of an indefinite dark color, with pale bands and under parts, without red, but with two rows on each side of very evident blackish specks—markings like those that persist in the adults of *E. vagrans*, for example. In two young specimens found *in utero*, the genital or intromittent organs are external to the anus, and extremely large when compared with the size of the individual. The placental cord is attached a short distance in advance of the anus.

EUTÆNIA RADIX. (B. & G.)

Racine Garter Snake.

Eutainia radix. BP. & GIL. Cat. N. Am. Reptiles, 1853, 34 (Racine, Wisconsin).—KENN. *apud* COOP. & SUCKL. N. H. Wash. Terr. 1860, 299 (Minnesota).

Eutania radix, COPE, Check List N. A. Bat. and Rep. 1875, 40.

Eutania haydeni, KENN. *apud* COOP. & SUCKL. Nat. Hist. Wash. Terr. 1860, 298, pl. 14 (Fort Pierre, Dakota).

Thamnophis haydeni, COPE.—HAYD. Trans. Amer. Assoc. xii. 1862, 177.

DESCRIPTION (No. 1027, Pembina, June 5, 1873).—This is one of the stoutest species of the genus. A specimen two feet long equals or rather exceeds in calibre a three feet long individual of *sirtalis* for example. The rapidly tapering tail, in a specimen 30 inches long, is $6\frac{1}{2}$ inches, or contained about $4\frac{2}{3}$ times in the total length—nearly 4 times in the length of body alone. The head is very short and thick, with a broad obtuse muzzle. The dorsal stripe, one scale and two half-scales broad throughout, is firm and continuous along the body, but less evident (sometimes extinguished altogether) on the tail. The lateral stripe is fairly two scales wide along most of the body, but only a scale and a half posteriorly, and but one scale on most of the tail; on the body it occupies the third and, for the most part, the fourth row of dorsal scales; on the tail it descends at once to the first row. Both dorsals and lateral bands are alike clear pale yellow, the former only occasionally deepening anteriorly into a more golden- or chrome-yellow. The body is olivaceous-blackish or obscure brownish-black, and of much the same tint above and below the lateral stripes. In the darkest and most "pitchy" black individuals, no markings are evident; in some lighter ones, there

are indications of obscure dark spots, scarcely or not, however, traceable in definite rows. In all the specimens, the series of spots below the lateral line are well marked and distinguishable, and in many cases the line of spots just above the lateral line is fairly perceptible. The belly is pale glaucous-olivaceous, touched with blackish on the sides of the scutes, and sometimes this color mingles with the dark of the sides below the lateral stripe. Unlike those species in which the lateral band is lower down, there is not so much difference in the size or shape of the first and second dorsal rows. The superior labials are normally seven, sometimes eight on one or both sides; they are light-colored, like the belly, but each has a touch of blackish along the posterior border. The dorsal rows are normally 21, and all quite broad. All the dorsal scales are strongly carinated, giving the animal a roughened, scabrous appearance. The length is oftener 2 to 2½ feet than more, but at all ages the bulk of the snake, as already indicated, is considerable.

The specimen here described, a gravid female, and others of the numerous ones collected, agree perfectly with the original diagnosis of the type from Racine, Wis. (whence the name "radix" is derived), and equally well with Mr. Kennicott's subsequent description of a specimen from Fort Snelling, Minn. Throughout the Red River region, from Pembina to where the Coteau de Missouri crosses the line, it is the characteristic Ophidian, the principal and almost the only representative of its order, outnumbering all the others put together. Indistinguishable specimens also occur in the eastern portions of the Missouri region at the same latitude, though there the greater number are of the *twiningi* type, which farther westward prevails altogether.

In the more fertile portions of the Red River Valley itself, this snake may be found almost anywhere in the brush and herbage. Out on the dryer prairie beyond, it is chiefly confined to the pools and streams, or their immediate vicinity. Numbers are found basking together on the muddy borders of the sloughs, or among masses of aquatic vegetation, where they find ample subsistence during the summer months in the tadpoles, young frogs, and various water insects. They are themselves preyed upon by hawks, especially the Marsh Harrier (*Circus cyaneus hudsonius*) and Swainson's Buzzard (*Buteo swainsoni*). They are less active than some of the slenderer species, are readily caught, and when captured make little or no resistance. Only the largest individuals assume for the moment a defensive attitude and attempt to bite; most may be at once handled with impunity. The greater part of the females observed in July and August will be found pregnant, the young numbering sometimes as many as thirty or forty. Individuals were taken *in coitu* in September and part of October. These observations together indicate a period of gestation protracted for the greater part of a year. The snakes become much less numerous in the latter part of September, but Dr. Coues occasionally saw them abroad on warm days up to the middle of October, even after there had been snow, sleet, and freezing of the more shallow waters.

EUTÆNIA RADIX TWININGI. *Coues & Yarrow.**Twining's Garter Snake.*

DESCRIPTION (No. 1135, Two Forks of Milk River, July 15, 1874).—From the Coteau de Missouri westward, in the arid region of the Upper Missouri and Milk Rivers, the characters of *E. radix* undergo considerable modification. The difference is easily recognized in life by an observer familiar with both kinds. The principal character is seen in the increased breadth and intensity of coloration of the dorsal band, especially on the anterior portion. This band is of a rich chrome-yellow or reddish-golden, contrasting strongly with the clear pale yellow of the lateral stripe. This richly-colored cadmium-yellow band commences as a minute linear trace on the middle borders of the two scales just posterior to the occipitals; it then covers a single scale in rear of these, gradually increasing until three or even four scales are covered, finally settling down to thin scales which continue down two-thirds of body, then covers one whole and two halves; opposite the anus, and to its termination, it is confined to two half-scales. At its broadest part, near the head, it is full three scales broad, and sometimes even three and two half-scales in width. There are slight or no indications of darker mottling, even in the lighter-colored specimens. Below the lateral band, the dark color is usually much broken up with mottling of the color of the belly. With much the same general form as in *E. radix*, the head appears decidedly narrower and less obtuse. In the specimen 1135 there are eight upper labials on right side, seven on left; it is a gravid female.

This form corresponds perfectly with certain geographical faunal areas which are represented in the region under consideration, a fact in further evidence of the propriety of distinguishing it. It is abundant about the prairie pools of the Upper Missouri and Milk Rivers; its habits are the same as those of *E. radix*. It does not appear to extend into the Saskatchewan watershed.

Dedicated to Maj. W. J. Twining, United States Engineers, in recognition of his cordial coöperation in the scientific interests of the Boundary Commission, and in expression of our personal consideration.

List of specimens (of both forms).

1013.	Pembina.	June 5, 1873.
1019.	Pembina.	June 7, 1873.
1020.	Pembina.	June 7, 1873.
1027.	Pembina.	June 7, 1873.
1047.	Pembina.	June 24, 1873.
1065.	Turtle Mountain	July 22, 1873.
1068.	Turtle Mountain.	July 23, 1873.
1089.	Mouse River.	Aug. 20, 1873.
1090.	Mouse River.	Aug. 20, 1873.
1091.	Mouse River.	Aug. 20, 1873.

1093.	Mouse River.	Aug. 25, 1873.
1100.	Big Muddy River.	June 25, 1874.
1117.	Porcupine River.	June 27, 1874.
1119.	Big Porcupine River.	June 29, 1874.
1130.	Frenchman's River.	July 8, 1874.
1132.	Near Frenchman's River.	July 12, 1874.
1132 bis.	Near Frenchman's River.	July 12, 1874.
1132 ter.	Near Frenchman's River.	July 12, 1874.
1135.	Two Forks of Milk River.	July 15, 1874.

To the foregoing species of Ophidians observed by the Boundary Commission may be added short notices of the following, known to occur in the Yellowstone region, and very probably extending farther north:—

EUTÆNIA PROXIMA. (Say) B. & G.

Say's Garter Snake.

Coluber proximus, SAY, Long's Exped. R. Mts. i. 1823, 187.—HARL. Journ. Acad. Nat. Sci. Phila. v. 1827, 353.

Tropidonotus proximus, HALLOW. Sitgreaves's Rep. Expl. Zuni and Colorado R. 1853, 134, 146.

Eutainia proxima, BD. & GIR. Cat. N. A. Reptiles. 1853, 25.—ALLEN, Proc. Bost. Soc. N. H. xvii. 1874, 69 (Yellowstone).—KENN. *apud* BD. U. S. Mex. B. Surv. ii. pt. ii. 1859, Reptiles, 16.

Eutœnia proxima, COPE, Check List N. A. Bat. and Rep. 1875, 40.

This is a stout species, like *E. radix* and *E. twiningi*, the total length only about $3\frac{1}{2}$ times that of the tail. The dorsal stripe is ochraceous-yellow; the lateral greenish-white or yellow on the third and fourth rows of scales; the dorsal rows are 19 in number. Carinae of scales of dorsal region are of a whitish hue, which gives the species a streaked appearance, and the upper anterior border of the last row of scales is lined with white. There are also irregular white spots near the row of black ones above lateral line; these are more profuse in some places than others. The belly is greenish-white, more yellowish anteriorly. Its known range is east of the Rocky Mountains, from the region of the Yellowstone to New Mexico and Texas. Specimens are in the National Museum from Texas, California, Wisconsin, North Carolina, Mexico, &c. A specimen from Tomales Bay, California, is the type of *E. imperialis*.

EUTÆNIA SIRTALIS PICKERINGI. (B. & G.)

Pickering's Garter Snake.

a. SIRTALIS.

Coluber sirtalis, LINN. Syst. Nat. i. ed. 12, 1766, 383.—GM. Syst. Nat. i. pt. iii. ed. 13, 1788, 1107.—HARL. Journ. Acad. Nat. Sci. Phila. v. 1827, 352.—HARL. Med. and Phys. Res. 116.—STORER, Rep. Reptiles Massach. 1839, 221.

Tropidonotus sirtalis, HOLBR. N. Am. Herpet. iii. 1842, 41, pl. 11.

Eutainia sirtalis, BD. & GIR. Cat. N. A. Rept. 1853, 30.

Tropidonotus tænia, DEKAY, N. Y. Fauna, iii. 1842, 43.

Tropidonotus bipunctatus, SCHL. Ess. Physiogn. Serp. 1837, 320.

Tropidonotus tænia, DEKAY, N. Y. Zool. 1842, 43, pt. 13, f. 27.

b. PICKERINGI.

Eutamia pickeringii, BD. & GIR. Cat. N. A. Rept. 1853, 27 (Puget Sound).—GIR. U. S. Expl. Exped. Herpet. 1858, 150, pl. 13, f. 14-20.—COOP. & SUCKL. Nat. Hist. Wash. Terr. 1860, 296.

Eutamia sirtalis subsp. *pickeringii*, COPE, Check List Bat. and Rep. N. A. 1875, 41.

This species was not procured by Dr. Coues, but is introduced on the strength of specimens from Fort Benton, Montana, collected by Lieutenant Mullan.

There are two well-marked forms of *E. sirtalis* subspecies *pickeringii*.

The spots confluent into a dark band.

a. With a lateral band.

b. No lateral band.

Baird and Girard say of the species,—“Body slender; black above, slate-color beneath; lateral stripe irregular, confluent with the light-colored intervals between the dark spots. This species exhibits great variation of color, principally in regard to black of abdomen.” In the reserve collection of reptiles in the National Museum are quite a number of specimens of the two differently marked subspecies all from one locality, viz, Fort Benton, Missouri, collected by Lieutenant Mullan of the Army. In this subspecies, the differences in number of labials may be frequently seen.

TROPIDONOTUS SIPEDON. (L.)

Water Snake.

Coluber sipedon, LINN. Syst. Nat. ed. 12, 1766, i. 379.—GMEL. Syst. Nat. ed. 13, 1788, pt. iii. 1098.—HARL. Journ. Phila. Acad. v. 1827, 351; Med. and Phys. Res. 114.—THOMPS. Hist. Vermont, 1842, 118.

Tropidonotus sipedon, HOLBR. N. Am. Herpet. iii. 1842, 29. pl. 6.—DEKAY, N. Y. Fauna, iii. 1842, 42, pl. 14, f. 31.—HAYD. Trans. Amer. Phil. Soc. xii. 1862, 177.

Nerodia sipedon, BD. & GIR. Cat. N. Am. Reptiles, 1853, 38.

Coluber pacilogaster, MAXIM. Reise Nord-Amer. i. 1839, 106.

This serpent appears to have been first found in the Upper Missouri region by the Prinz Maximilian von Neu Wied, who described it under the name of *Coluber pacilogaster*; and it was subsequently observed in the Yellowstone country by Dr. F. V. Hayden. It is one of the commonest and best known species of the Eastern United States. The serpent of this region, however, may not be typical *sipedon*, but rather *woodhousii* or *erythrogaster*. Reptiles of this genus (comprising *Nerodia* and *Regina* of Baird and Girard) are the most completely aquatic ones of this country. The species of *Nerodia* proper are dark-colored, more or less evidently blotched, stout and rather repulsive, quite pugnacious when full grown, and commonly regarded as venomous under the name

of Water Adder, or Water Moccasin: needless to say, like other true *Colubrines*, they are perfectly harmless. Those of the other section, *Regina*, are slenderer, and banded lengthwise, much like *Eutania*.

PITYOPHIS SAYI BELLONA. (*B. & G.*) Cope.

Say's Pine Snake.

a. SAYI.

- Coluber sayi*, SCHL. Ess. Physiogn. Serp. 1837, 157. (Not *Coronella sayi* of Holbrook or *Coluber sayi* of DeKay, which is *Ophibolus*.)
Pituophis sayi, BD. & GIR. App. Cat. N. A. Rept. 1853, 152 (in text under *Coluber sayi*, p. 151).—KENN. *apud* COOP. & SUCKL. Nat. Hist. Wash. Terr. 1860, 300, pl. 22.—HAYD. Trans. Amer. Phil. Soc. xii. 1862, 177.

b. BELLONA.

- Churchillia bellona*, BD. & GIR. Stansbury's Rep. Great Salt Lake, 1852, 350.
Pituophis bellona, BD. & GIR. Cat. N. Am. Rept. 1853, 66, 157.
Pityophis bellona, KENN. *apud* BD. P. R. R. Rep. x. 1859, Williamson's Route, Reptiles, 42.—KENN. *apud* BD. U. S. Mex. B. Surv. ii. pt. ii. 1859, Reptiles, 18.—BD. U. S. P. R. R. Rep. x. 1859, Beckwith's Route, Reptiles, 19.—COPE, Proc. Acad. Nat. Sci. Phila. 1863, 305.—ALLEN, Proc. Bost. Soc. Nat. Hist. xvii. 1874, 69.
Pityophis sayi var. *bellona*, COPE, Check List Bat. and Rep. N. A. 1875, 39.
Pituophis affinis, HALLOW, Proc. Acad. Nat. Sci. Phila. vi. 1852, 181.—HALLOW. Sitgr. Rep. Expl. Zuni and Colorado R. 1853, 130, 146.

The species of this genus, known as "Pine" and "Bull" Snakes, are of large size, sometimes attaining a length of six feet or more. They are perfectly harmless, and appear of a rather sluggish and inoffensive disposition. They are light-colored (whitish, yellowish, or even reddish), but thickly blotched above with a dorsal series of numerous large brown or brown black-bordered spots, and other smaller lateral ones; on each side of the belly is usually found (as in the case of the present species) a row of black spots, one on each scutellum. Several upper dorsal series are lightly carinated; the rest are smooth. The tail is very short, about one-twelfth of the whole length, half-ringed above with black, and having lateral black spots. There is a dark stripe across the head from one eye to the other, continued behind each eye to the angle of the mouth. The head is very small, and the neck contracted. The general blotched character of the upper parts is somewhat in superficial appearance like that of *Crotalus confluentus* or *Heterodon nasicus*; but very little further observation is required to recognize the decided distinctions.

The best known species of this genus is the *P. melanoleuca*, the Common Pine or Bull Snake of the Eastern United States. An excellent and interesting account of the habits of this species, by the Rev. S. Lockwood, will be found in the American Naturalist for January, 1875.

Serpents of this genus vary notably in the construction of the plates of the head. A specimen of *P. bellona*, from the Yellowstone, collected by Mr. Allen in the expedition of 1873, presents the following case:—A

large subpentagonal, shield-shaped vertical. Single large, triangular superorbital. A pair of moderate occipital and numerous small temporals. In advance of the vertical is a small azygos plate, wedged in between the connivent postfrontals. Two pairs of postfrontals. One pair of prefrontals. Two nasals, the nostril between them. A small loreal. Two anteorbitals; the lower very small; the large, upper one bounding nearly all of the orbit anteriorly. Three small postorbitals. A large obtuse rostral. Eight superior labials, the eye over the fourth and fifth, the penultimate one largest.

After a careful examination of many specimens of *P. sayi bellona* and *P. sayi mexicana* in the National Museum, we find no absolute diagnostic value in the entire number of superior and inferior labials and number of dorsal scales, and are rather of the opinion that these two species should be grouped together under Baird and Girard's original name of *bellona*. Further investigation may show that *catenifer* Blainv. should be brought under the same head.

OPHIBOLUS GETULUS BOYLI. (*B. & G.*) Cope.

Ophibolus boylii, BD. & GIR. Catal. N. Am. Reptiles, 1853, 82.—BD. P. R. R. Rep. x. 1859.

Williamson's and Abbott's Route, Reptiles, 11.—BD. U. S. Mex. B. Surv. ii. pt. ii.

1859, Reptiles, 20.—COPE, Proc. Acad. Nat. Sci. Phila. 1866, 305.

Lampropeltis boylii, COPE, Proc. Acad. Nat. Sci. Phila. 1860, 255.

Ophibolus getulus subsp. *boylii*, COPE, Check List N. A. Bat. and Rep. 1875, 37.

Coronella baltcata, HALLOW. "Pr. Acad. Nat. Sci. Phila. vi. 1853, 236".—HALLOW. P. R. R. Rep. x. 1859, Williamson's Route, Reptiles, 14.

A specimen of this species, contained in a collection from the Yellowstone, offers the following characters:—The color is lustrous brownish black, crossed at intervals of about an inch by narrow rings of pure white, which gradually widen on the sides to a breadth greater than that of the black interspaces. On the belly, these white rings are sometimes opposite, and then are continuous with the white coming down from the other side, and sometimes alternate, when they abruptly meet the black, producing a checkered pattern. These points are wholly irregular, both being observable in different parts of the same specimen. In this specimen, which is about $3\frac{1}{2}$ feet long, there are in all forty-four rings, including some which are incomplete, that is, existing only on one side; for the rings on the back, as on the belly, are not always continued all around, some broken ones finding no fellow on the opposite side. In other specimens, there is also the greatest variety in all these details of pattern. The fore part and sides of the head are irregularly blotched with black and yellowish, and there are yellowish specks on the occiput.

This species is found abundantly in Pacific and Sonoran districts, and grows to a large size. The dark bands in Californian specimens in life are of a lustrous blackish-green bronze. Its discovery in Montana is an interesting fact, as there is but one specimen in the National Museum from that region.

The genus *Ophibolus* comprises a considerable number of species of very handsomely marked serpents, in all of which a black, brown, or red ground is crossed by light markings. The *Ophibolus getulus* is a common Eastern species, black like the present, and ringed with yellow, but the rings bifurcate on the sides.

OPHIBOLUS MULTISTRATA. (Kenn.)

Lampropeltis multistriata, KENN. Proc. Acad. Nat. Sci. Phila. 1860, 328. (By err. typog. for *multistrata*. "Fort Lookout, Nebraska", by err. for Fort Benton, Montana.)—HAYDEN, Trans. Amer. Phil. Soc. xii. 1862, 177 (Fort Benton).

Ophibolus multistratus, COPE, Check List N. A. Bat. and Rep. 1875, 37.

The locality of the original specimen is stated by its discoverer to be Fort Benton, Montana, not "Fort Lookout, Nebraska". Another error occurred in the original notice of the species, the name being printed *multistriata* for *multistrata*, in allusion to the number of rows of scales.

BASCANIUM FLAVIVENTRE. (B. & G.)

Yellow-bellied Black Snake.

Coluber flaviventris, SAY, Long's Exped. R. Mts. ii. 1823, 185.

Bascanium flaviventris, BD. & GR. Cat. N. A. Reptiles, 1853, 96.—BD. U. S. Mex. B. Surv. ii. pt. ii. 1859, Reptiles, 20.—HAYD. Trans. Amer. Phil. Soc. xii. 1862, 177.—ALLEN, Proc. Bost. Soc. N. H. xvii. 1874, 69 (Yellowstone).

This species is dark olive-green above and bright yellow beneath, being distinguished from the usual style of *B. constrictor* by these characters, the last-named species being lustrous pitch-black above and ordinarily greenish-black below. These characters, however, are not diagnostic, as more or less yellow-bellied Eastern *constrictor* often occurs.

Inasmuch as individuals of *B. constrictor*, which have not attained their adult state, resemble greatly in coloration *B. retustum*, color cannot be relied upon as a specific point in diagnosis. The position of certain of the upper labial and their relation to the eye and that of the lower postorbital afford the most reliable means of distinguishing the species. In *Bascanium constrictor*, a line drawn slightly obliquely backward from the junction of the third and fourth upper labials will pass directly through the centre of the pupil of the eye. The same line drawn in *B. retustum* would pass slightly anterior to the centre of the pupil, and in the latter species the lower postorbital lies in a notch between the fourth and fifth upper labials. In *B. constrictor*, the lower postorbital rests on the upper border of the fourth upper labial. In some cases, the position of the lower postorbital in *B. retustum* differs on different sides of the same individual. The young of *B. retustum* can hardly be distinguished from the young of *B. constrictor* except by the position of the lower postorbital. The description of the young by Baird and Girard, p. 94 of their Catalogue, is excellent, and should be relied upon, as young specimens differ so materially in coloration from adults.

The typical and best known species of this genus is the common Black Snake of the United States (*B. constrictor*). All the species agree in their slender form and perfectly smooth, lustrous scales and uniform coloration while adult, though the young are somewhat particolored. They grow to a large size, and are noted for their powers of constriction. They are among the most active and agile of our serpents, possessing eminent scansorial powers, and are persistent enemies of numerous small birds, whose nests they rob of the eggs or young.

CYCLOPHIS VERNALIS. (DeK.) Günth.

Coluber vernalis, DEKAY, MS.—HARL. Journ. Acad. Nat. Sci. Phila. v. 1827, 361; Med. and Phys. Res. 1835, 124.—STORER, Rep. Mass. Rept. 1839, 224.—HOLBR. N. Am. Herpet. iii. 1842, 79, pl. 17.—DEKAY, N. Y. Fauna, iii. 1842, 40, pl. 11. f. 22.—Thomps. Nat. Hist. Vermont, 1842, 117.

Chlorosoma vernalis, BD. & GIR. Catal. N. Am. Rept. 1853, 103.

Herpetodryas vernalis, HALLOW. Proc. Acad. Nat. Sci. Phila. 1856, 243.

Liopeltis vernalis, COPE. Proc. Acad. Nat. Sci. Phila. 1860, 560.—HAYD. Trans. Amer. Phil. Soc. xii. 1862, 177.

Cyclophis vernalis, GÜNTHER, Cat. Col. Snakes Brit. Mus. 1853, 119.

Observed by Dr. Hayden on the Yellowstone.

In vol. v, Zoology, of Ex. for Expl. West of One Hundredth Meridian, mention is made by Dr. Yarrow, p. 539, of the discovery of this species at Abiqui, N. Mex., and in the Am. Nat. vol. —, p. —, the same author relates that it was found by Lieutenant Carpenter in Colorado. These facts extend greatly its southern limit. *C. aestivus*, the Eastern and Southern species, has been found in New Mexico, Texas, and Western Missouri.

The two species are readily distinguishable: *C. vernalis* having 15 rows of smooth scales, 7 upper labials, 8 lower; and *C. aestivus* having 17 rows of strongly carinated scales, except the outer row, which is smooth, and the second slightly keeled; upper labials 7, lower labials 8.

SAURIA.

Family IGUANIDÆ.

Genus PHRYNOSOMA. Wieg.

PHRYNOSOMA DOUGLASSI. (Bell) Gray.

Horned Lizard; *Horned "Toad"*; *Horned "Frog"*.

a. DOUGLASSI.

Agama douglassii, BELL, Trans. Linn. Soc. xvi. 1829, 105, pl. 10.—BELL, Isis, Bd. xxiii. 1830, 910.—HARL. Med. and Phys. Res. 1835, 141, f. 3.

Phrynosoma douglassii, GRAY, Griffith's An. King. ix. 1831, 44.—WAGL. Nat. Syst. Amph. 1830, 146.—WIEGM. Herp. Mex. 1834, 54.—HOLBR. N. Am. Herpet. i. 1842, 101, pl. 14.—GRAY, Cat. Br. Mus. 1845, 227.—GIRARD, Stansbury's Rep. Expl. Great Salt Lake, 1852, 362, pl. 7, f. 6-9 (monographic).—COPE, Proc. Acad. Nat. Sci. Phila., 1866, 302.—ALLEN, Proc. Bost. Soc. Nat. Hist. xvii. 1874, 69.

Phrynosoma douglassii subsp. *douglassii*, COPE, Check List N. A. Bat. and Rep. 1875, 49.
Tapaya douglassii, GIRARD, U. S. Ex. Ex. Herpet. 1858, 398, pl. 21, f. 1-5.—Bd. P. R. R. Rep. x. 1859, Gunnison's and Beckwith's Route, Reptiles, 18.—Bd. P. R. R. Rep. x. 1859, Williamson's and Abbott's Route, Reptiles, 9.—COOP. & SUCKL. N. H. Wash. Terr. 1860, 294.

b. ORNATISSIMA.

Phrynosoma orbiculare, HALLOW. Sitgreaves's Rep. Expl. Zuni and Colorado Rivers, 125, pls. 8, 9. (Nec Wiegman.)

Tapaya ornatissima, GIR. U. S. Expl. Exped. Herpet. 1858, 395.—Bd. P. R. R. Rep. x. 1859, Whipple's Route, Reptiles, 38.—Bd. U. S. Mex. B. Surv. ii. pt. ii. 1859, Reptiles, 9.

Phrynosoma douglassii subsp. *ornatissimum*, COPE, Check List N. A. Bat. and Rep. 1875, 49.

Specimens.

1148. Milk River at 49°. July 26, 1874.

1153. Sweetgrass Hills. Aug. 3, 1874.

1154. Sweetgrass Hills. Aug. 3, 1874.

Representatives of the order *Sauria* are even fewer in number than those of the *Ophidia* in this latitude (49° N.), and the present is the only species which was observed by the Commission. Two others, however, are given beyond as probably occurring on the line east of the Rocky Mountains. Six, including the present species, are described from Washington Territory by Drs. Cooper and Suckley.

Douglass's Horned Lizard is the most abundant and widely diffused of the six or eight known United States species of the genus *Phrynosoma*. It ranges in fact throughout nearly all parts of the West, from the Mexican to the British Boundary, reaching the latter in the region of the Milk River. Its northernmost extension east of the Rocky Mountains at any rate appears to be only in the Missouri watershed. Dr. Coues obtained no indication of its presence in any part of the Red River region. It was found quite commonly on the Milk River, where this stream crosses the Line, and thence westward to the Rocky Mountains. In these latitudes, its range appears to coincide with that of *Crotalus confluentus*.

The present species may be known among the congeners by the orbicular shape of the body in connection with the very slight development of the cephalic spines, which are, in fact, no more than pointed scales, little different from those on other parts of the body. In some other species, the body is more elongated or oval, and certain plates upon the head are developed into long spines. The coloration is variegated and diffuse, and differs greatly in different individuals, especially farther south, where there is greater latitude in this respect than at the north. In this region of northernmost extension, the colors are almost uniform and quite pale, and the size is usually small. The coloration of the animal depends greatly upon the color of the ground where found, and it is our impression that this species possesses to a limited degree a modified power of chameleonization seen in other Saurians.

Although commonly called "Horned Toads", or "Horned Frogs", from hasty consideration of a superficial resemblance in shape to some of the

Batrachia, these animals are true Lizards, belonging to a large group which contains the Iguana, and numerous well known smaller species of this country. The presence of a tail, which is not found in adult life in the typical Batrachians; the scaly armor of the body, as contrasted with the naked skin of Batrachians; the mode of development, in not passing through a larval Tadpole stage, in which the species breathe in the water by means of gills; and the ambulatory, not saltatorial, mode of progression, are some of the prominent characteristics by which the *Phrynosomæ* show their true affinities.

Although of rather repulsive aspect, the Horned Lizards are inoffensive and perfectly harmless animals. They are rather sluggish, easily captured, make no resistance, and are readily tamed, when they make rather amusing pets for those who may desire to watch their sly and furtive ways. They feed principally upon flies, ants, and other small insects, which they catch by rapid protrusion of their viscid tongue, leaping, or rather running, at their prey sometimes. One that had been tamed would eat from the fingers, and also take a drop of milk, appearing greatly to relish it. Like other cold-blooded animals, they sustain long fasts without apparent inconvenience, and may be safely mailed alive, as curiosities, to almost any part of the country. We have never been able to keep them alive over four months.

The subspecies of this same *P. douglassii* (*ornatissimum*) is principally found in the Sonoran region, but specimens are in the National Museum from Utah and Upper Colorado and Pole Creek (wherever that may be).

SCELOPORUS CONSOBRINUS. B. & G.

Sceloporus consobrinus, Bd. & Gir. Marcy's Rep. Expl. Red R. 1853, 224, pl. 10, f. 5-12.—Bd. P. R. R. Rep. x. 1859, Whipple's Route, Reptiles, 37.—Bd. U. S. Mex. B. Surv. ii. pt. ii. 1859, Reptiles, 5.—HAYD. Trans. Amer. Phil. Soc. xii. 1862, 177.—COPE, Proc. Acad. Nat. Sci. Phila. 1866, 303.—COPE, Check List N. A. Bat. and Rep. 1875, 49.—ALLEN, Proc. Bost. Soc. Nat. Hist. xvii. 1874, 69 (from the Yellowstone).

Lately obtained by Mr. J. A. Allen on the Yellowstone, and has been found in Utah and Nevada. Belongs to the Sonoran and Central region, Oregon?, and Texas.

Family SCINCIDÆ.

Genus EUMECES. Wieg.

EUMECES SEPTENTRIONALIS. (Bd.)

Northern Skink.

Plestiodon septentrionalis, Bd. Proc. Acad. Nat. Sci. Phila. 1858, —.—Bd. P. R. R. Rep. x. 1859, Whipple's Route, Reptiles, 38, pl. 24, f. 2.—HAYD. Trans. Amer. Phil. Soc. xii. 1862, 177.

Eumeces septentrionalis, COPE, Check List N. A. Bat. and Rep. 1875, 44.

Originally described from Minnesota, and also known to occur in Nebraska and Kansas.

B.—BATRACHIA.

ANURA.

Family BUFONIDÆ.

Genus BUFO.

BUFO LENTIGINOSUS FOWLERI. (*Putnam, MSS.*)*Fowler's Toad.**Bufo americanus* var. *fowleri*, "PUTN. MSS."*Bufo lentiginosus* subsp. *fowleri*, CORE, Check List N. A. Bat. and Rep. 1875, 29.*Specimens.*

1006.	Pembina.	June 3, 1873.
1012.	Pembina.	June 5, 1873.
1028.	Pembina.	June 7, 1873.
1031.	Pembina.	June 7, 1873.
1066.	Turtle Mountain.	July 23, 1873.
1070.	Turtle Mountain.	July 24, 1873.
‡ 1086.	Mouse River.	Aug. 17, 1873.
‡ 1092.	Mouse River.	Aug. 25, 1873.

Abundant along the line throughout the Red River watershed, where it was the only species observed. Westward, in the Missouri and Milk River region, it appears to be entirely replaced by the following species:—

BUFO COLUMBIENSIS. *Bd. & Gir.**Columbia Toad.*

Bufo columbiensis, Bd. & Gir. Proc. Acad. Nat. Sci. Phila. 1853, 378.—GIR. Proc. Acad. Nat. Sci. Phila. 1854, 87.—GIR. U. S. Expl. Exped. Herpet. 77, pl. 5, f. 4-9.—Bd. P. R. R. Rep. x. 1859, Williamson's and Abbott's Route, Reptiles, 12.—COOP. & SUELL. N. H. Wash. Terr. 1860, 304.—ALLEN, Proc. Bost. Soc. Nat. Hist. xvii. 1874, 70.—CORE, Check List N. A. Bat. and Rep. 1875, 29.

Specimens.

‡ 1177.	Kootanie River.	Aug. 17, 1874.
1181.	Chief Mountain Lake.	Aug. 19, 1874.
1183.	Chief Mountain Lake.	Aug. 23, 1874.
1190.	Chief Mountain Lake.	Aug. 24, 1874.
1191.	Chief Mountain Lake.	Aug. 24, 1874.

This species, originally described from the Pacific slopes, and not generally recognized as occurring east of the Rocky Mountains, was

found to be very common in the above-named localities. It was also procured on the Yellowstone by Mr. Allen. The palmation of the feet renders it much more decidedly aquatic in habit than is usual in this genus. I found it swimming freely in the lake, as well as in various streams and pools about the eastern base of the Mountains. Specimens were taken from the stomach of *Salmo namaycush* and other fish of the same genus in this locality, further indicating its aquatic nature. The colors of the specimens inhabiting these clear cold waters are notably fresh and firm.

Family RANIDÆ.

Genus RANA.

RANA HALECINA. *Kalm.*

Leopard Frog.

"*Rana pipiens*, GM.", *Syst. Nat.* 13th ed. 1788, 1052 (*nec auct.*).

Rana halecina, KALM.—DAUD. *Hist. Nat. Rept.* viii. 1803, 122.—HARL. *Journ. Acad. Nat. Sci. Phila.* v. 337; *Med. and Phys. Res.* 102, 224.—DEKAY, *N. Y. Fauna*, iii. 1842, 63, pl. 20, f. 19.—HOLBR. *N. Am. Herpet.* iv. 1842, 91, pl. 13.—ID. *P. R. R. Rep.* x. 1859; Whipple's Route, Reptiles, 45.—COOP. & SUCKL. *N. H.*, Wash. Terr. 1860, 304, pl. 29, f. 7.—HAYD. *Trans. Amer. Phil. Soc.* xii. 1862, 177.—COPE, *Proc. Acad. Nat. Sci. Phila.* 1866, 301.—ALLEN, *Proc. Bost. Soc. Nat. Hist.* xvii. 1874, 70.

Specimens.

1064, <i>bis</i> , <i>ter</i> , etc.	Near Pembina Mountains.	July 9, 1873.	Numerous specimens.
?1081.	Souris River.	Aug. 16, 1873.	
?1081, <i>bis</i> .	Souris River.	Aug. 16, 1873.	
1118.	Wolf Creek.	June 28, 1874.	
1118, <i>bis</i> .	Wolf Creek.	June 28, 1874.	
?1167.	Head of Milk River.	Aug. 14, 1874.	

A series of specimens, demonstrating the general dispersion of the species in the permanent waters of the region explored. It occurs in Washington Territory, and I have found it in New Mexico and Arizona, as well as in various localities in the Eastern United States, where it is one of the most abundant and well-known species, conspicuous in its size, rich coloration, and agility.

The common Western form is *Rana halecina berlandieri*, which is only distinguished from *R. halecina* by its larger size and generally coarser and more pustulated skin. The specimens represent "*berlandieri*", but this we are disinclined to adopt without further investigation of its alleged distinctness.

Rana septentrionalis of Baird (*Proc. Phila. Acad.* 1854, p. 61) is accredited with a range from "Canada to Montana", but was not observed.

Family HYLIDÆ.

Genus CHOROPHILUS.

CHOROPHILUS TRISERIATUS. (*Maxim.*)

Heleceles triseriatus, MAXIM. Reise Nord-Am. i. 1839, —. —HAYD. Trans. Amer. Phil. Soc. xii. 1862, 177.

Chorophilus triseriatus, COPE, Check List N. A. Bat. and Rep. 1875, 30.

Specimens.

1123, *bis*, *ter*, etc. Frenchman's River. July 6, 1874.

This small species was found in the greatest abundance in prairie pools* and streams at various points along the line, especially at Frenchman's River, where numerous specimens were secured. It forms a considerable portion of the food of the *Eutania* of this region. Specimens are also in the Natural Museum from Colorado, New Mexico, Nebraska, and Kansas.

Family AMBLYSTOMATIDÆ.

Genus AMBLYSTOMA. *Tsch.*AMBLYSTOMA MAVORTIUM. *Bd.**a. MAVORTIUM.*

Ambystoma mavortia, BD. Journ. Acad. Nat. Sci. Phila. 2d ser. i. 1849, 292, 284 (New Mexico).

Ambystoma mavortium, HALLOW. Journ. Acad. Nat. Sci. Phila. iii. 1858, 352.

Amblystoma mavortium, BD. P. R. R. Rep. x. 1859, Gunnison's and Beckwith's Route, Reptiles, 20.—COPE, Proc. Acad. Nat. Sci. Phila. 1867, 184.—ALLEN, Proc. Bost. Soc. Nat. Hist. xvii. 1874, 70.—COPE, Check List N. A. Bat. and Rep. 1875, 25.

Amblystoma proserpina, BD. & GIR. Proc. Acad. Nat. Sci. Phila. 1852, 173.—BD. U. S. Mex. B. Surv. ii. pt. ii. 1869, Reptiles, 29, pl. 35, f. 7-14.

Ambystoma proserpine, HALLOW. Journ. Acad. Nat. Sci. Phila. iii. 1858, 354.

Ambystoma maculatum, HALLOW. Journ. Acad. Nat. Sci. Phila. iii. 1858, 355.—HALLOW. Proc. Acad. Nat. Sci. Phila. 1857, 215.

Desmlostoma maculatum, "SAGER, Penins. Journ. Med. 1858, 428.

Camarataxis maculata, COPE, Proc. Acad. Nat. Sci. Phila. 1859, 123.

Ambystoma nebulosum, HALLOW. Proc. Acad. Nat. Sci. Phila. 1852, 209 (Arizona).—HALLOW. Sitgreaves's Rep. Expl. Zuni and Colorado R. 1853, 143, pl. 20.—HALLOW. Journ. Acad. Nat. Sci. Phila. iii. 1858, 352.

Amblystoma? *nebulosum*, COPE, Proc. Acad. Nat. Sci. Phila. 1866, 300.

b. CALIFORNIENSE.

Ambystoma californiense, GRAY, Proc. Zool. Soc. Lond. 1853, 11, pl. 7 (Monterey).—HALLOW. Journ. Phila. Acad. Nat. Sci. iii. 1858, 355.

Amblystoma mavortium subsp. *californiense*, COPE, Check List N. A. Bat. and Rep. 1875, 25.

* These pools also furnished great numbers of an interesting Phyllopod, *Lepidurus couesi* of Packard.

Specimens.

1045.	Pembina.	June 24, 1873.
1057.	Pembina.	June 28, 1873.
1071.	Turtle Mountain.	July 28, 1873.
1074.	Turtle Mountain.	Aug. 11, 1873.
1074 <i>bis</i> .	Turtle Mountain.	Aug. 1, 1873.
1137.	Two Forks of Milk River.	July 15, 1874.

Common in suitable situations all along the line. In all the specimens observed, the metamorphosis from the *Siredon* stage was completed at a length of four or five inches. In other regions, I have procured the same species, still in the *Siredon* stage, but nearly twice as large. Individuals were found in damp places about the buildings at Fort Pembina and vicinity, and still more numerous around the pools at the western base of Turtle Mountain. They wandered freely away from the water, and in some instances entered our tents.

In life, the coloration of the specimens examined was clear olive above, more glaucous or greenish-white below, everywhere variegated in bold pattern with black.

In addition to the foregoing, the only species of the genus observed by the commission, a second is described as inhabiting the region about the eastern portions of the line. This is the *Ambystoma laterale* of Hallowell (Journ. Acad. Nat. Sci. Phila. iii. 1858, 352), now regarded as a variety of *Amblystoma jeffersonianum* Bd. (*op. cit.* i. 1849, 283) (*Xiphonura jeffersoniana* Tschudi, Class. Batrach. 1838).

Amblystoma aterrimum Cope (Proc. Acad. Nat. Sci. Phila. 1867, 201) is a species described from the Northern Rocky Mountains, in the region explored by Lieutenant Mullan.

ART. XII.—ON CONSOLIDATION OF THE HOOFS IN THE VIRGINIAN DEER.

BY DR. ELLIOTT COUES, U. S. A.

Mr. George A. Boardman, of Calais, Me., has obligingly submitted to my examination the feet of a Deer (*Cariacus virginianus*) displaying the abnormality of consolidation of the hoofs.

The state of the specimens does not permit any examination of the condition of the bones themselves. As well as can be judged from inspection, and by feeling through the dried skin which covers them, they are entirely normal.

The false hoofs are present and of ordinary characters.

The malformation seems to be confined to the horny substance of the true hoof, which is consolidated with its fellow of the opposite. The union is complete along the whole inner margins of the hoof, excepting a notch between the two halves at the end less than half an inch in depth.

Viewed from above, the hoof shows its composition by lateral halves, there being a profound longitudinal sulcus, along the bottom of which groove is the line of union, complete to within less than half an inch of the end.

On the plantar surface, the confluence of the hoofs gives a nearly plane surface, without special indication by a sulcus of the line of union, to within about an inch of the end, where a median depression, bounded by raised edges, marks the seam, the extremity being nicked, or notched, as already said. The outer border of the sole of the foot is smoothly rounded off behind; but anteriorly, for about half the length of the whole hoof, the margins are raised and sharp-edged,—this edge terminating behind in a scroll-like inversion. This sharp margin is the outer edge of each hoof along that portion of its length which is ordinarily applied to the ground.

The profile view of the hoof displays the deformity of excessive growth in length, the whole hoof being unnaturally elongated, with the end curved upward, rendering the fore border strongly concave in profile, and causing the hind and under border to fall into one long and continuous curve, with convexity downward.

Besides such elongation and curvature, the whole hoof is unnaturally contracted, or laterally compressed; the sides, which should expand downward and outward, curving downward and toward each other, so

that the greatest width of the plantar surface between the lateral sharp edges is much less than the diameter of the hoof across the top.

Length of the hoof in front (chord of the concave border) nearly two inches. Entire length of the hoof behind (chord of the convex curve from base to tip) three inches. Greatest width of the hoof, both halves together, less than one inch—this measurement being taken near the base of the hoof behind. Width of either half, at a point opposite ends of the hairs in front, only *four-tenths* of an inch.

The general constriction of the hoof is of course of a part with its consolidation; while its lengthening and curvature are doubtless the progressive result of growth under circumstances not permitting the normal spread and play of each hoof upon the ground.

This monstrosity is clearly a freak in an individual case, belonging to the general category of web-fingering; and it is not to be compared with the more profound modifications of the pig's foot which I describe in the succeeding article. Its occurrence is so obviously and seriously disadvantageous that it could scarcely be perpetuated to any extent.

ART. XIII.—ON A BREED OF SOLID-HOOFED PIGS APPARENTLY ESTABLISHED IN TEXAS.

BY DR. ELLIOTT COUES, U. S. A.

My attention has recently been called to this matter by communications from a valued correspondent, Mr. G. W. Marnock, of Helotes, Bexar County, Texas, who has further laid me under obligations by transmitting the well-prepared specimen from which the accompanying illustration has been made.

Like the monstrosity of cleft-hoof occasionally witnessed in the horse or ass, the peculiarity of the solid hoof is already known to occur in the domestic pig. Thus, I am informed by Professor Baird of his recollection of such a case, there having been many years ago a number of solid-hoofed pigs in the possession of a person residing near Carlisle, Pa., who specially valued them for some advantage which the peculiarity was supposed to confer. Professor Leidy also tells me that the same thing is within his knowledge.

As in the case of the monstrosity of cyclopism, which is of comparatively frequent occurrence in these animals, however, the formation of the solid hoof seems to have been regarded as a mere freak of nature, or monstrosity in the usual sense of that term; whereas I gather from my correspondence with Mr. Marnock that the solid hooved pigs of Texas are established as a race which transmits its peculiarities to its offspring as surely as it does any other portion of its structure. I should judge from Mr. Marnock's remarks that the solid-hoofed pigs of his locality constitute a large proportion, if not a majority, of the species.

The peculiarity is so firmly established that no tendency to revert to the original and normal form is observable in these pigs. Mr. Marnock informs me that the cross of a solid-hoofed boar with a sow of the ordinary type produces a litter the majority of which show the peculiarity of the male parent.

He alludes to a popular belief which ascribes the origin of this breed to crossing with the peccary,—this being of course fallacious.

The upshot of this modification of the foot is that a strictly artiodactyle animal is transformed into an imperfectly perissodactyle one. As far as the hoof itself is concerned, the pig is completely solidungulate. It is also perfectly "odd-toed", or single-toed, in the terminal phalanges, ankylosis of which produces a single broad phalanx in the axis of the limb. Above this, however, the other two phalanges, medial and proximal, of each of the two principal lateral digits, remain perfectly dis-

tinged, and, moreover, widely separated from each other by intervention of a special ossicle, doubtless a sesamoid, in the axis of the foot immediately above the single terminal phalanx.

The actual structure, both of the bones of the digits and of the horny hoof, will be appreciated from a glance at the accompanying figure. This is engraved of life size, front view, with the hoof withdrawn sufficiently to display all the parts. The preparation is



from a young subject about three months old, in which the proximal epiphyses of the phalanges are still evident. The pair of distinct proximal phalanges of normal characters, or nearly so, are seen to be succeeded by nodular medial phalanges, which latter, as well as the distal extremities of the proximal phalanges, are widely separated by intervention of a special ossicle in the axis of the foot. To these succeeds a single broad and flattened terminal phalanx, obviously composed of the pair of distal phalanges ankylosed together. In this specimen, the ankylosis is complete, even at so early an age of the subject; its condition apparently being not the result of progressive confluence of the two bones, but of their original connation.

The terminal phalanx is flattened and somewhat scooped out on its posterior aspect, without trace of previous separation into halves. In front, however, as shown by the figure, it presents a central triangular elevation, apex downward, and base articulated with the nodular ossicle above it, as if a wedge of bone had been thrust into the axis of the limb between the primitive distal phalanges. This wedge-shaped piece of bone is completely ankylosed with the present single distal phalanx; and below its apex the edge of the bone is perfectly continuous across the axis of the foot.

The central nodular ossicle, which I have already mentioned as a sesamoid, articulates with all five of the bones of the foot. I cannot account for its presence unless it be a displaced sesamoid, such as for example that which is normal beneath the base of the distal phalanx of the horse, and known to some as the "*os subarticulatum*". In the normal pig's foot, there are several pairs of sesamoids beneath the phalangeal articulations; and the bone in question may be regarded as a confluence of the pair at the base of the distal phalanges, or of two pairs at the bases of the medial and distal phalanges respectively. The displacement of these sesamoids brings the ossicle into position in the axis of the foot between instead of under the bones. Or, it may be that this ossicle is a confluent pair of sesamoids from beneath the basis of the medial phalanges, and that the wedge-shaped piece of bone which appears upon the front of the distal phalanx, consolidated therewith, represents sesamoids from beneath the distal phalanges.

The horny hoof encases these bones as far as the distal extremities

of the proximal phalanges. It is perfectly whole, or "solid", as seen in the figure. In front, there is a slight, though evident, vertical line of impression along the middle, indicating its composition from lateral halves. On the sole of the hoof, there is a broad, angular elevation of horny substance, apex forward, and sides running backward and outward to the lateral borders of the hoof, the whole structure being curiously like the frog of the horse's hoof. In fact, it is a frog, though broad, flattened, and somewhat horseshoe-shaped, instead of being narrow, deep, and acute, as in the actual frog of the horse. This arcuate thickening of the corneous substance occupies about the middle third of the whole plantar surface of the hoof.

Viewing the apparent establishment of this pseudo-perissodactyle structure in an artiodactyle, the question arises whether we have not, under our eyes, an example of a way in which a solidungulate may be evolved from a pluridigitate stock—though of course the one case is by enlargement of a single median digit and reduction of lateral digits, while in the present instance a bone in the axis of the limb is produced by failure of fission between lateral paired digits. Nothing is more certain than that the present solid-hoofed horse has come by direct descent, with modification, from its several-toed ancestors of the Tertiary. In the present case, we seem to have the initial steps of an actual transformation which may in time result in modifications to which ordinal value may attach. It may be suggested that this modification is one of progressive adaptation of the animals to their freely-ranging state on the prairies of the country, just as the series of modifications which the primitive horse's foot has undergone in adaptation to the making of the most serviceable hoof for running on hard ground at the expense of any other function.

